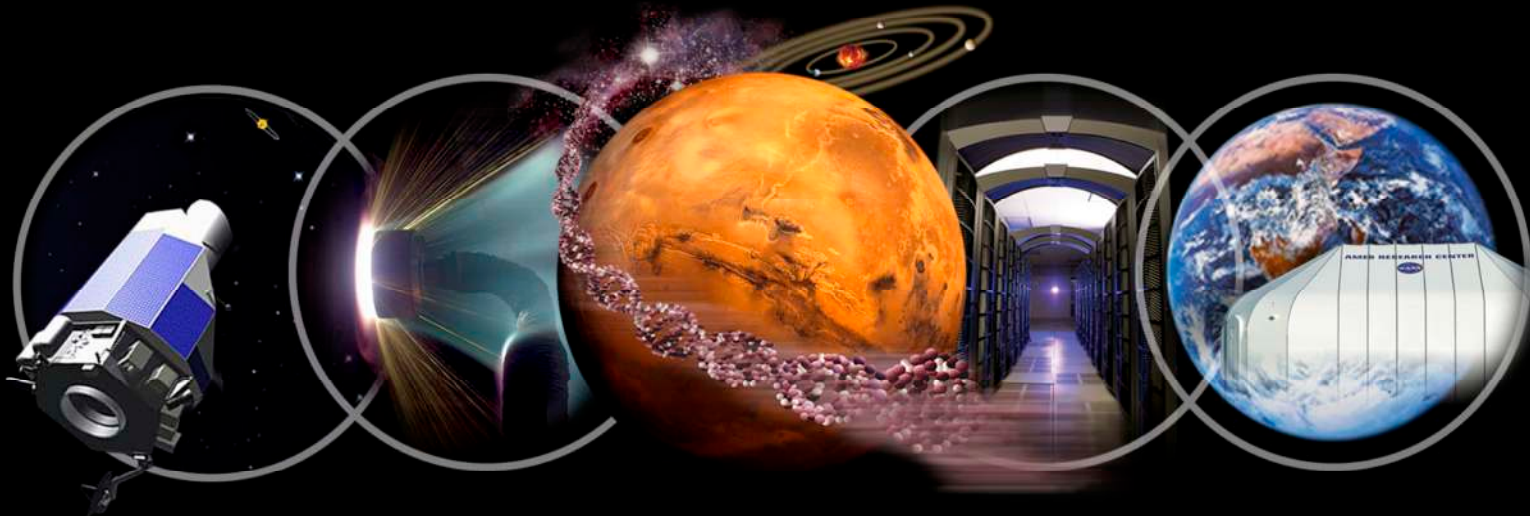


Discovery ➡ Innovation ➡ Solutions



# NASA Ames: Earth Science, Astrobiology & Computation

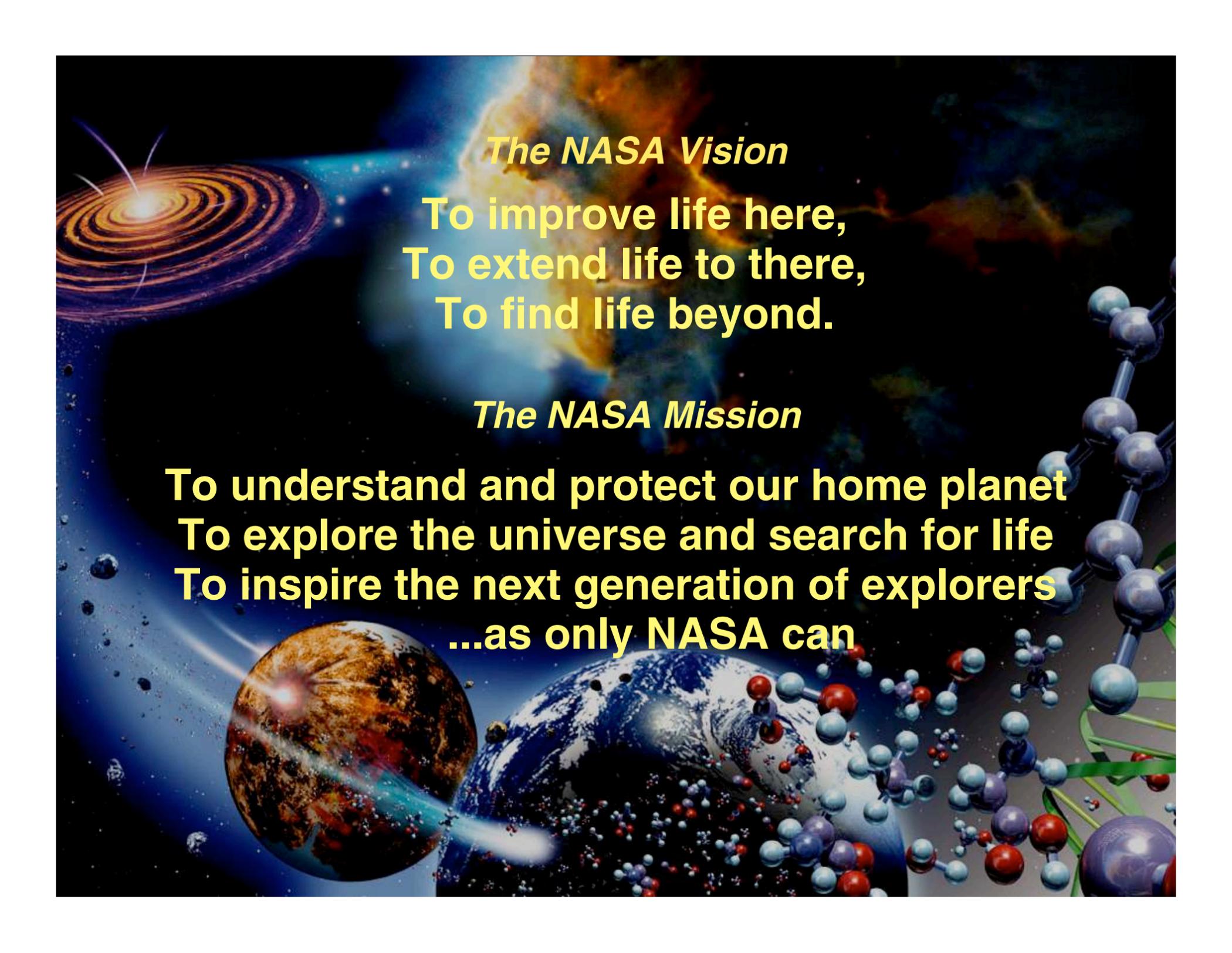
G. Scott Hubbard  
Center Director

June 22, 2004



Visibility ➡ Excellence ➡ Impact





***The NASA Vision***

**To improve life here,  
To extend life to there,  
To find life beyond.**

***The NASA Mission***

**To understand and protect our home planet  
To explore the universe and search for life  
To inspire the next generation of explorers  
...as only NASA can**



**Ames: Science and Technology Systems for Exploration**

# NASA Ames Research Center Today -founded 1939

**Science (Earth-Life-Space): Astrobiology- the study of life in the universe**

## **Science Missions**

- **Stratospheric Observatory For Infrared Astronomy**
- **Kepler Mission-Search for Habitable Planets**
- **Space Station Biological Research Project**

## **Technology for Science and Exploration**

- **Information Technology (Autonomy, Human Factors, High-End Computing)**
- **Nanotechnology**
- **Bio-Info-Nano Fusion**
- **Thermal Protection Systems**

## **Aviation and Aeronautics**

- **Air Traffic Management and Control**

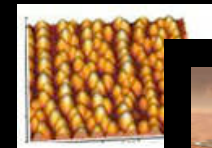
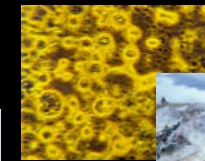
## **Education**

## **Innovative Collaborations**

**NASA Research Park**

**University Affiliated Research Center**

Discovery ➡ Innovation ➡ Solutions

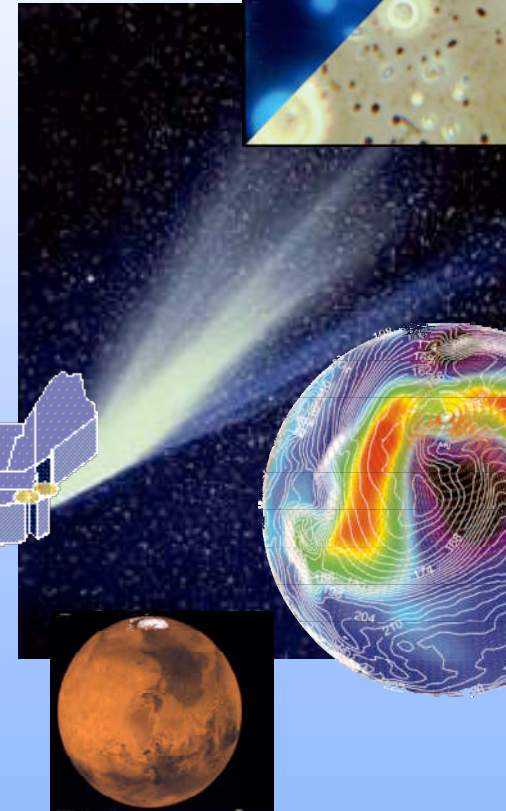
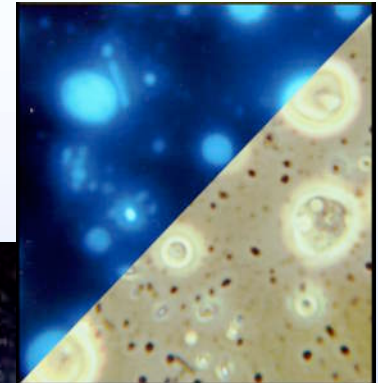
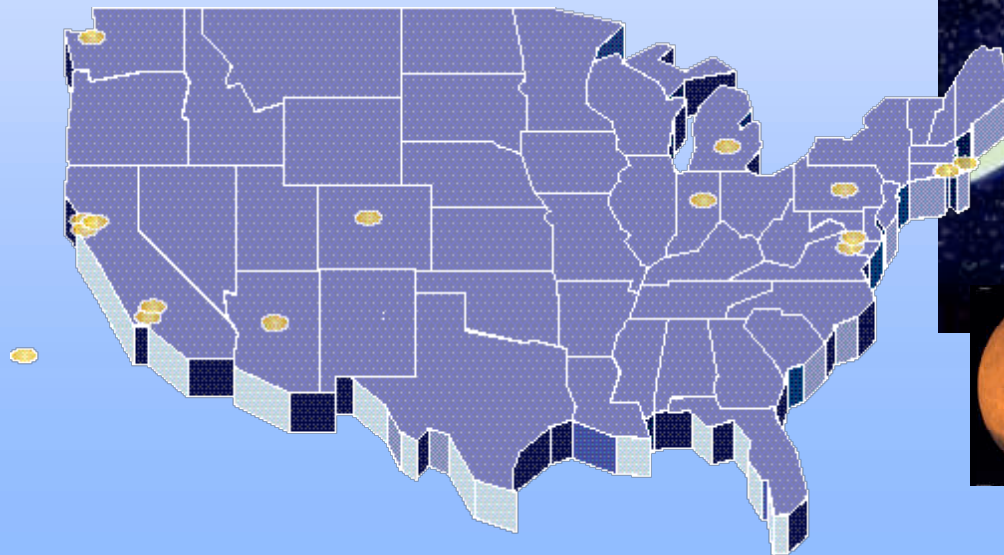


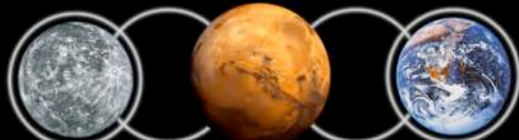
**Mars Dome**



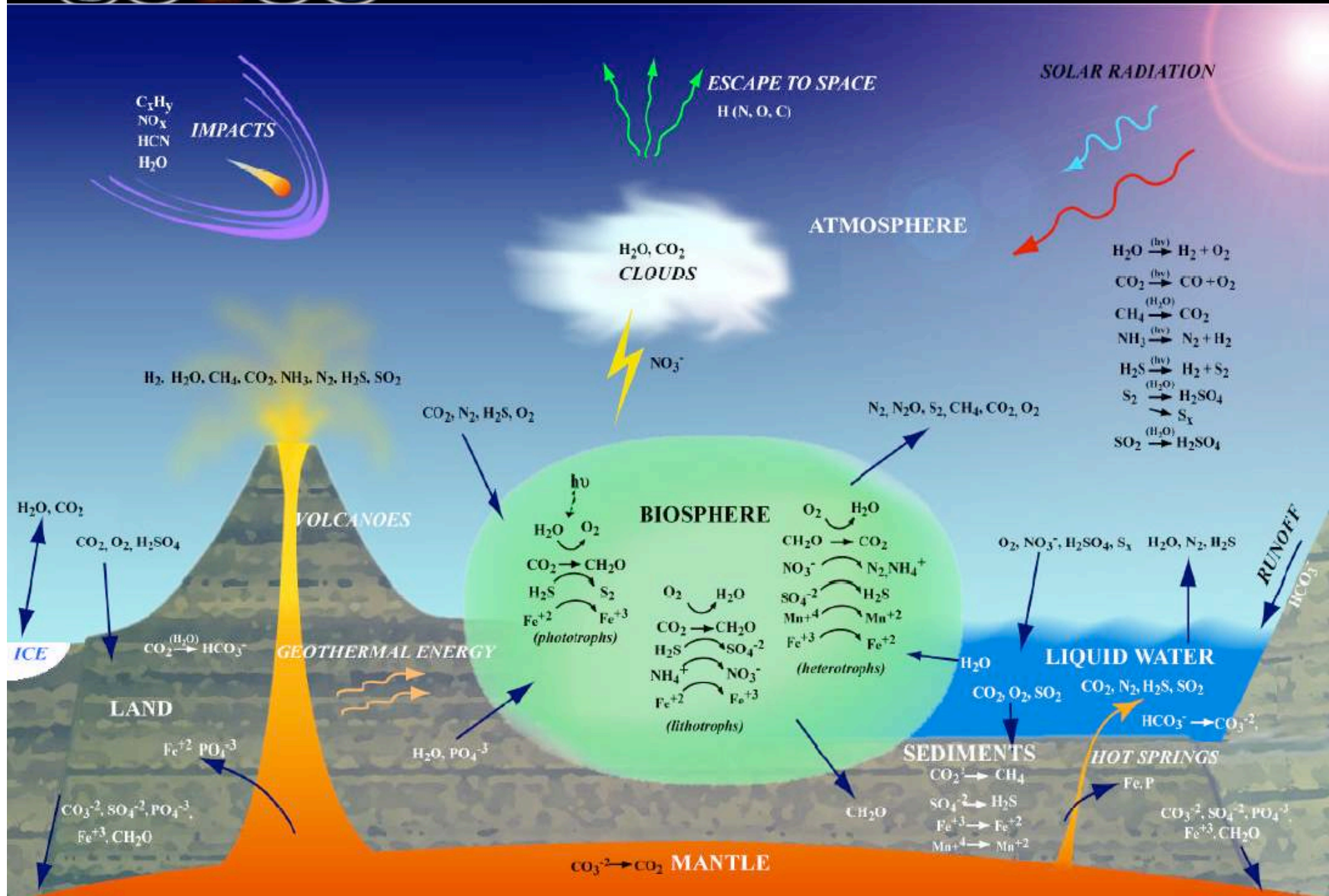
# Astrobiology

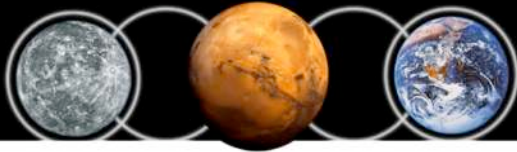
- Scientific study of life in the universe
- Three fundamental questions
  - How does life begin and evolve?
  - Does life exist elsewhere in the universe?
  - What is life's future on Earth and beyond?
- NASA Astrobiology Institute at Ames
  - Dr. Bruce Runnegar, Director
  - 16 lead member institutions





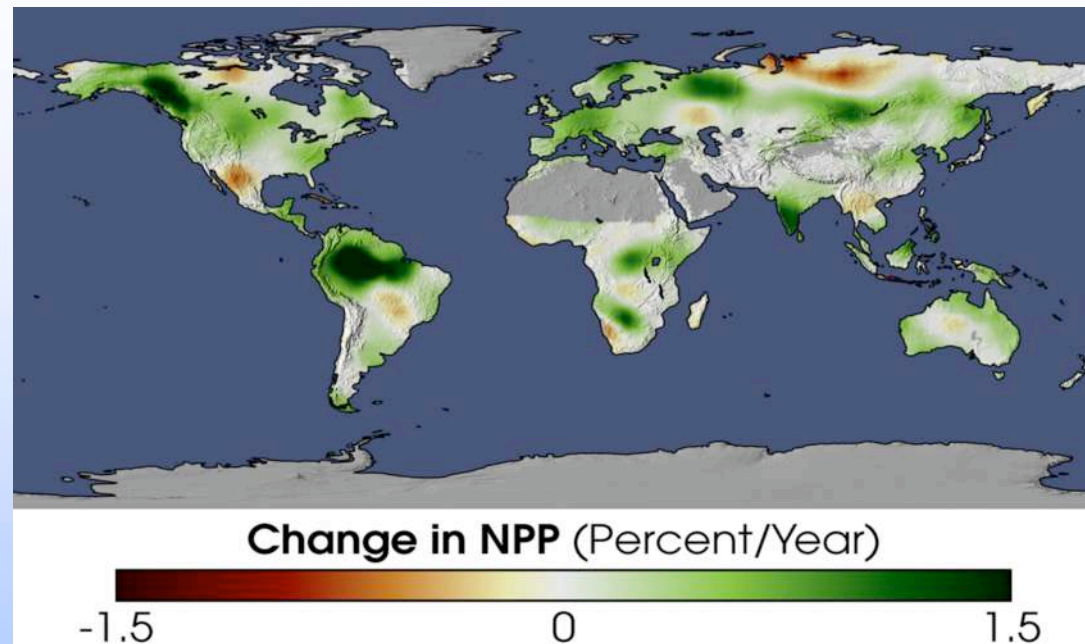
## Ames: Science and Technology Systems for Exploration



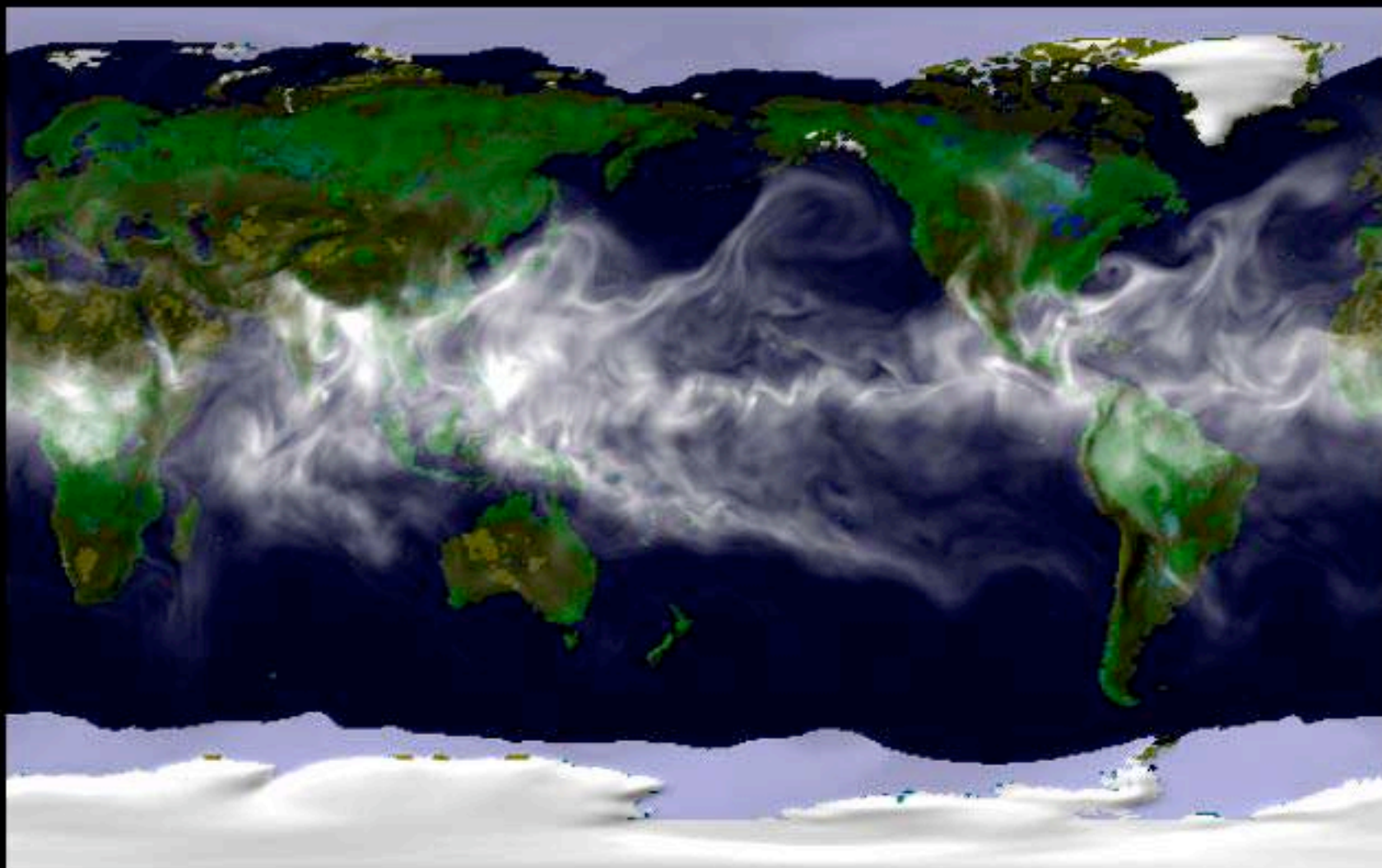


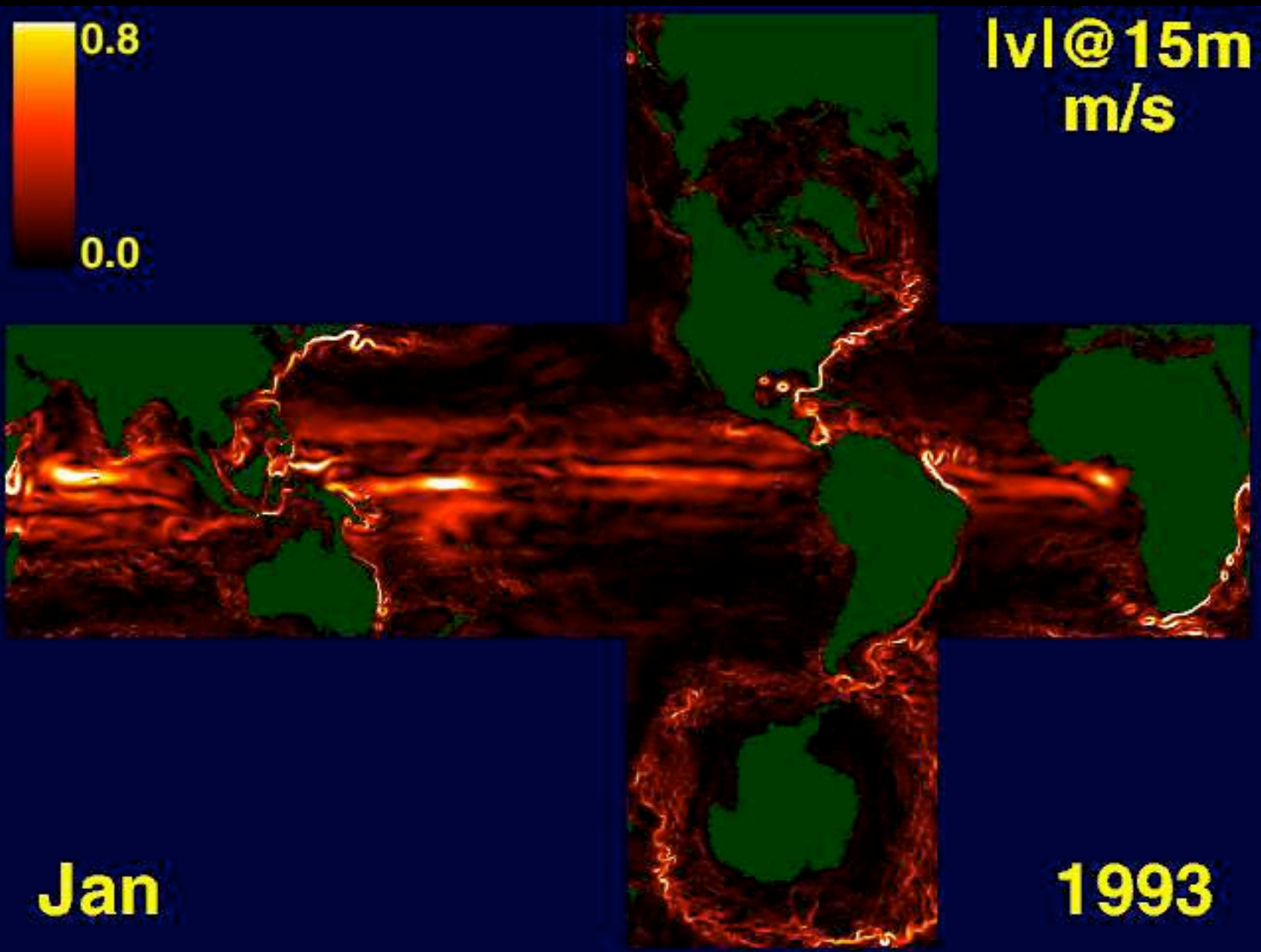
## Greening Earth:

Increases in Net Primary Production (plant growth) observed from satellites between 1982-1999



- **Dr. R. Nemani invited by the UN Environmental Program (UNEP) to present his work on impact of climate change on global biological productivity (Science, 2003). Work demonstrates importance of NASA Earth Observing satellites.**
- **Dr. Nemani to accompany Ghassem Asrar in India to discuss his results and to encourage India's participation in international Global Earth Observation effort.**







## Bio/Info/Nanotechnology

Ultra small  
arrays

“NASA Ames - One of the  
largest single nanotechnology  
research centers in the  
world.”\*

Data Storage

$10^{21}$   
bytes/cm

Quantum Dots

CNT-coated  
interface

Metal-metal  
contact

Thermal control device for  
space telescopes

Carbon nanotube tips on  
Atomic Force  
Microscopes...

CNT  
probe

...may go to Mars

\* January 20, 2004 "Nanoscience and  
Nanotechnology: Opportunities and Challenges in  
California" report prepared by the California Council  
on Science and Technology for the state legislature.



## Uninhabited Aerial Vehicles (UAV's)

UAVs have great potential as science and applications platforms

Measurements beyond current piloted platform capabilities

- Altitudes above U-2
- Durations beyond DC-8
- Locations dangerous to pilots

Low cost atmospheric satellites

- Timely insertion of new sensor technology
- Inexpensive flight costs
- Sensor repair feasible
- Inexpensive cycle of new sensor technology
- Science timeframes compatible with emerging graduate students



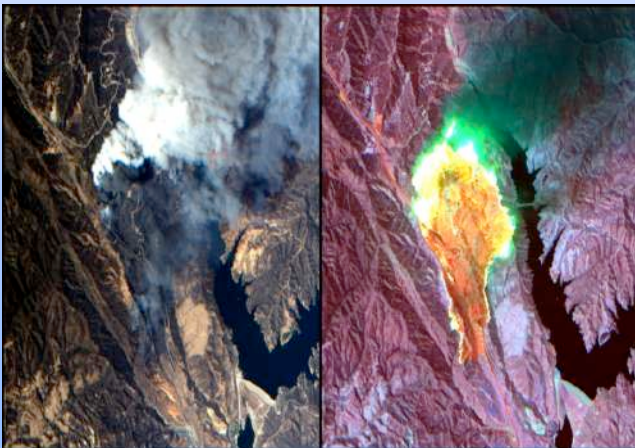


**Ames: Science and Technology Systems for Exploration**

## **UAV Sensor Development Project:**

**3 Earth Science Instruments are being built for UAV operations**

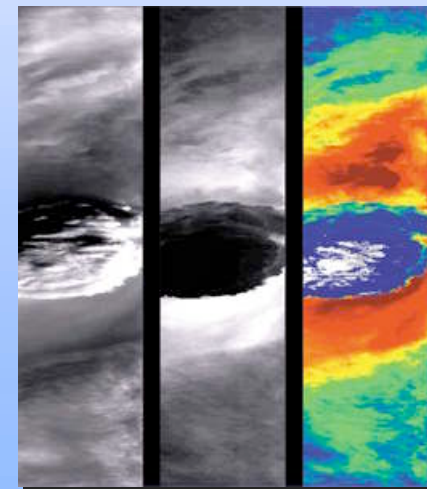
- **Atmospheric Mapping Sensor**
- **Wild Fire & H<sub>2</sub>O Vapor**
- **Ocean Color Imager**
- **Long-Duration, Autonomous Operation**
- **Operational 3Q '04**



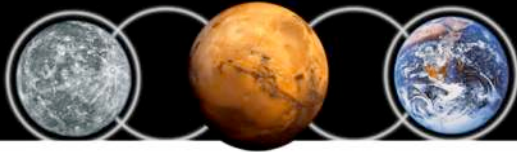
**Wild Fire Research**



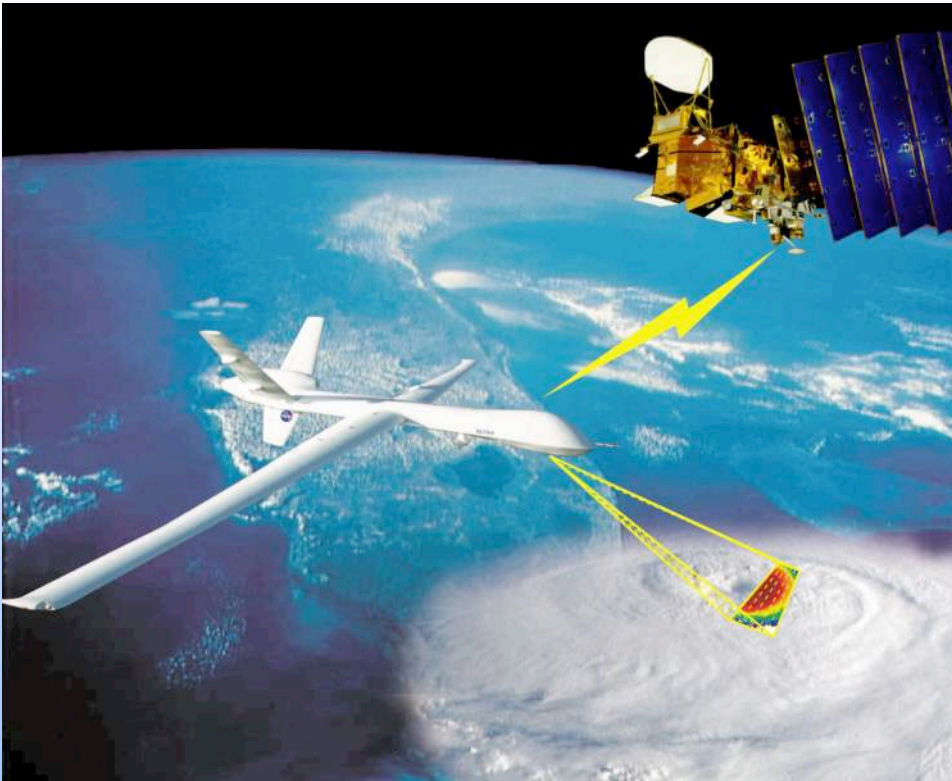
**Ocean Color / Coral Reef Research**



**Hurricane and Atmospheric Studies**



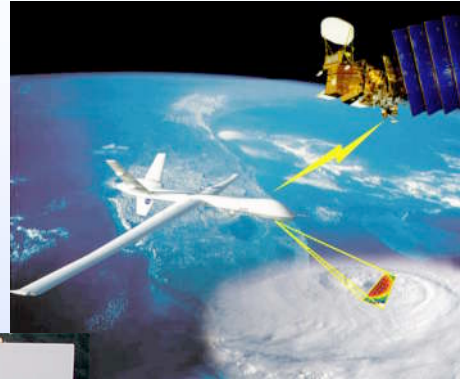
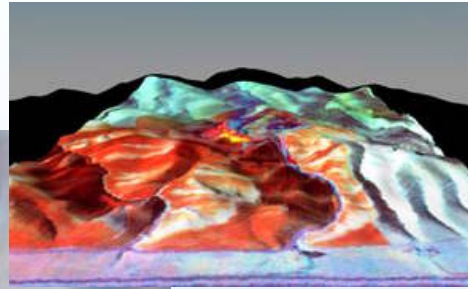
## UAV Sensor Engineering Activities



- Airborne Sensor facility
- Developing new downsized instrumentation
- Developing standards, especially in the software arena, for instrument interfaces to simplify development and operation



## National Leadership:



NASA Research Park

18

UAV Applications Center  
Clark University



- Ames with Clark University and NASA Dryden established the UAV Applications Center in the NASA Research Park in August 2003.
- UAVAC focal point for unique expertise at Ames in sensor development, nano technology, earth and space science.
- Addresses national priorities in earth science, homeland security, and future planetary studies beyond Earth.



Ames: Science and Technology Systems for Exploration

# New Collaboration Models-NASA's first University Affiliated Research Center- the UARC

Flexible, efficient portal to all 10 UC campuses (4 rated among top 15 worldwide) + 3 National Laboratories

**UARC is well established in the Park**

- ~25 funded research tasks\*
  - 100 UC and subcontract staff at NASA and NASA Research Park (NRP)
  - Current tasks are funded at ~\$16m/year
- 20 joint appointments made thus far
- Subcontract for Systems Teaching Institute in place--Initial students onboard

**UC System**  
(\$15B annual budget)

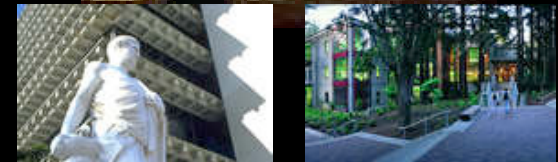


**\*Space radiation task with world's leading expert**

**UC President Robert Dynes**



**3 Bay Area Campuses**



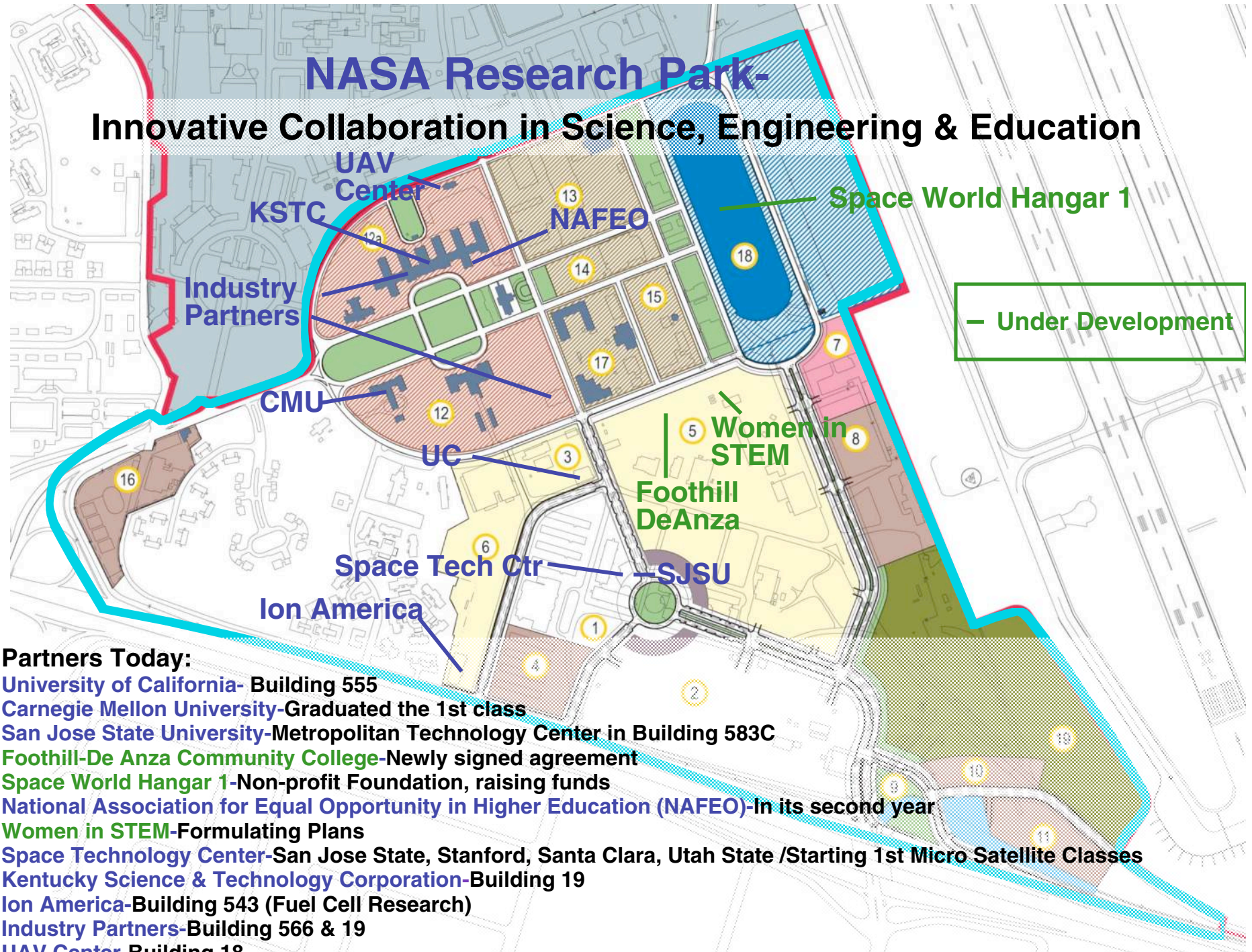
**Sr. Vice President, formerly Chancellor of UCSC, MRC Greenwood dedicates new School of Engineering**



**University of California**  
*It Starts Here*

# NASA Research Park-

## Innovative Collaboration in Science, Engineering & Education



### Partners Today:

**University of California-** Building 555

**Carnegie Mellon University-**Graduated the 1st class

**San Jose State University-**Metropolitan Technology Center in Building 583C

**Foothill-De Anza Community College-**Newly signed agreement

**Space World Hangar 1-**Non-profit Foundation, raising funds

**National Association for Equal Opportunity in Higher Education (NAFEO)-**In its second year

**Women in STEM-**Formulating Plans

**Space Technology Center-**San Jose State, Stanford, Santa Clara, Utah State /Starting 1st Micro Satellite Classes

**Kentucky Science & Technology Corporation-**Building 19

**Ion America-**Building 543 (Fuel Cell Research)

**Industry Partners-**Building 566 & 19

**UAV Center-**Building 18